

CLAIMS

What is claimed is:

1. A process for polymerizing one or more vinylically-unsaturated monomers, wherein the process comprises:
 - 5 contacting said vinylically-unsaturated monomers with a chain transfer catalyst and a hydrogen atom donor molecule in the absence of conventional free radical initiators,
 said process carried out at a temperature from about room temperature to about 240 °C, optionally in the presence of a solvent.
- 10 2. An improved process for polymerizing one or more vinylically-unsaturated monomers by contacting said vinylically-unsaturated monomers with a glyoximato-based cobalt chain transfer catalyst and a hydrogen gas in the absence of conventional free radical initiators, said process carried out at a temperature from about room temperature to
15 about 240 °C, optionally in the presence of a solvent,
 wherein the improvement is the selection of the catalyst from the family of hydrogen bridged bisglyoximato ligands.
- 20 3. An improved process for polymerizing one or more vinylically-unsaturated monomers by contacting said vinylically-unsaturated monomers with a cobalt chain transfer catalyst and a hydrogen gas in the absence of conventional free radical initiators, said process carried out at a temperature from about room temperature to about 240 °C, optionally in the presence of a solvent,
 wherein the improvement is the addition of an electron donor.
- 25 4. The process of Claim 1, 2 or 3, wherein the temperature is about 50°C to 150°C.
5. The process of Claim 1 wherein the chain transfer catalyst is selected from the group consisting of cobalt(II) and cobalt(III) chelates or a mixture thereof.
- 30 6. The process as recited in Claim 1, 2 or 3, wherein said process is a batch process.
7. The process of Claim 1, 2 or 3, wherein said process is a semi-batch or starved feed process.
8. The process of Claim 1, 2 or 3, wherein said process is a
35 continuous process.
9. The process of Claim 1, wherein the hydrogen atom donor is chosen from the group consisting of dihydronaphthalene, silicon hydrides,

tin hydrides, organometallic hydrides, benzylic alcohols, hydroquinones, alkyl ether hydroquinones, and benzhydrol.

10. The process of Claim 9, wherein the hydrogen atom donor is dihydronaphthalene, triethylsilane, tributyltin hydride, hydroquinone,
5 methyl ether hydroquinone, tetraethylcyclotetrasiloxane, methyldimethoxysilane, tetramethyldisiloxane, trimethylsilane, or benzhydrol.

11. The process of Claim 1, 2 or 3 wherein the process is conducted in the presence of a solvent selected from the group consisting
10 of ketones such as acetone, butanone, pentanone and hexanone; alcohols such as isopropanol; amides such as dimethyl formamide; aromatic hydrocarbons such as toluene and xylene; ethers such as tetrahydrofuran and diethyl ether; ethylene glycol; glycol ethers, alkyl esters or mixed ester ethers such as monoalkyl ether-monoalkanoates;
15 and mixtures of two or more solvents.

12. The process of Claim 1, 2, or 3, wherein the monomer in a homopolymerization or at least one or more of the monomers in a copolymerization are selected from the group consisting of Class I monomers.

20 13. The process of Claim 1, 2 or 3, wherein the monomer in a homopolymerization or at least one or more of the monomers in a copolymerization are selected from the group consisting of Class II.

14. The process of Claim 1, 2 or 3, wherein one or more monomers are independently selected from Class I and Class II.

25 15. The process of Claims 12 and 14 wherein the resulting product is terminally unsaturated.

16. The process of Claim 2 or 3, wherein the hydrogen pressure is from 0.01 to 100 atmospheres (1 to 10,000 kPa).

30 17. The process of Claim 2 or 3, wherein the hydrogen pressure is from 1 to 10 atmospheres (100 to 1000 kPa).

18. The process of Claim 3 wherein the electron donor is selected from amines, nitrogen heterocycles such as pyridines, imidazole, pyrrole, pyrimidine, benzpyrazole, and phosphorus donor ligands.

35 19. The process of Claim 3 wherein the electron donor is selected from nitrogen heterocycles such as pyridines, imidazole, pyrrole, pyrimidine, benzpyrazole, and phosphines.

20. The product by the process of Claims 1, 2 or 3.

21. The use of the products of Claim 20 in non-metallic chain transfer agents, components and intermediates in the production of graft copolymers, non-aqueous dispersed polymers, block copolymers, microgels, star polymers, branched polymers, structured polymers and
5 ladder polymers.

22. The use of the products of Claim 20 as or as components in architectural coatings; automotive finishes, including high solids, aqueous and solvent-based finishes; high-build maintenance finishes and other paints; printing inks including ink jet inks and UV/EB curable inks;
10 multilayer coatings; varnishes; crosslinking agents; defoamers; deaerators; wetting agents; substrate wetting additives; surface control additives; reactive surface control additives; hydrophobing agents; antigraffiti agents; nucleating agents; personal care products; masks for screen printing; dental filling materials; adhesives; lubricants; oil drilling
15 fluids; adhesion promoters; coupling agents; dispersants (e.g., for pigments); grinding agents; solder masks; tackifiers; leveling agents; artificial stone and marble; impact modifiers; compatibilizers; plasticizers; caulks; sealants; drug delivery agents; electronic materials; processing aids; antistatics; softeners; antioxidants; UV stabilizers; dispersion media;
20 release agents; ion exchange resins or membranes; molded objects; extruded objects; chain transfer reagents; photopolymerizable materials; and etch or permanent resists for printed electronic circuits.

23. The use of hydroxy-functionalized products of the process of Claim 20 in rigid polyurethanes, polyurethane foams, polyurethane
25 adhesives and polyurethane finishes.